REMARKS

Claims 1, 3-6, 8-15, 20, 24-27, 30 and 31 are pending in the instant application. The Examiner has cited various informalities in claims 1, 8-10, 12, 15, 20 and 31. Claims 4, 5, 27 and 30 stand rejected under 35 USC § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1, 3-6, 8, 9, 11-15, 20, 27 and 30 stand rejected under 35 USC § 112 as being unpatentable over Yu [US 6103492] in view of Buck *et al* ["Photochemically induced dynamic nuclear polarization[…]" Biochemistry 77(9) pp5145-8]. The application has been amended. The claims have been amended. Applicant respectfully submits that none of the amendments introduce new matter in contravention of 35 U.S.C.§132. Reconsideration is respectfully requested.

Claim Rejections – informalities

The various informalities outlined in respect of claims 1, 8-10, 12, 15, 20 and 31 have been taken into account and the certain suggested amendments have been made.

Applicant respectfully submits that the Examiner's objections to certain terms, namely 'hyperpolarising', 'hyperpolarisation, 'analysing', 'analysed', 'hybridisation', 'polarisation', etc., are improper as each of these terms is well understood in the English language and as used in the instant application. As support, Applicant submits photocopied pages 41 and 900 of Merrian-Webster's Collegiate Dicitonary, Tenth Edition, for definitions of the words 'analyse' and 'polarize' showing that each are simply British variants of 'analyze' and 'polarize'. Additoinally, Applicant directs the Examiner's attention to United States Patent Nos. 7,186,550 and 7,107,169 as merely two examples of the word 'hybidisation' being used in the very first issued claim. Applicant notes that many more patents have issued using these very same terms in their claims, indicating their acceptability.

In view of the amendments and remarks hereinabove, it is respectfully submitted that each of the noted objections have either been obviated by amendment or traversed as being improper. Reconsideration and withdrawal of the objections is respectfully requested.

Claim Rejections – 35 USC § 112

Claims 4, 5, 27 and 30 are rejected under 35 USC § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 4 and 5 have been amended such that the term "artificially high concentration" has been replaced with the term "artificially-enriched abundance". The replacement term finds basis in the application as filed on page 3 lines 25-28 as well as on page 6 lines 15-32. Applicant submits that the teaching of the specification provides ample guidance to the skilled person as to what the term "artificially-enriched abundance" means.

Claim 27 has been amended such that the wording refects that in the specification as filed on page 17 lines 30-32. Applicant submits that "no well, surface or container" does not require antecedent basis as re-worded and also that the phrase now clearly applies only to the aerosol.

Claim 30 in its present form is not regarded by Applicant as being indefinite for the reasons outlined by the Examiner. Applicant respectfully submits that the Examiner's argumentation is flawed in that claim 30 does not encompass both a broad range and a narrow range. Claim 30 definitively encompasses one preferred value from the range set out in claim 5, i.e. "one specific position" as a preferred value from "up to 10 defined positions". It is Applicants belief that the limitation of claim 30 is thus abundantly clear to one of ordinary skill in the art.

In view of the amendments and remarks hereinabove, Applicant respectfully submits that each rejection under 35 USC § 112, second paragraph has been traversed. Reconsideration and withdrawal of the rejections are respectfully requested.

Claim Rejections – 35 USC § 103

Claims 1, 3-6, 8, 9, 11-15, 20, 27 and 30 are rejected under 35 USC § 112 as being unpatentable over Yu [US 6103492] in view of Buck *et al* ["Photochemically induced dynamic nuclear polarization[…]" Biochemistry 77(9) pp5145-8]. The rejection is respectfully traversed.

As stated by the Examiner, neither Yu nor Buck teach that the degree of hyperpolarisation of the NMR active nucleus is in excess of 0.1%. However, the Examiner contends that to get from the combined teachings of Yu and Buck to the subject matter of claim 1, the skilled person would only need to use routine skill in the art. In response to Applicant's previous arguments filed September 18 2006, the Examiner is not persuaded that claim 1 is inventive over the teachings of the prior art. The Examiner contends that the assay performed by Buck is only an example of a hyperpolarisation assay rather than being a limitation on the technique disclosed by Buck. The Examiner further contends that there is no showing by the Applicant that the hyperpolarisation technique is any different from that disclosed by Buck.

Applicant respectfully contends this assertion. The method of Buck is photochemically-induced dynamic nuclear polarization [CIDNP] in which the NMR signal intensity is enhanced by contact of a sample with a photoexcited dye. As presented in Applicant's response dated September 18 2006, the level of polarization achievable with this method is in the order of 0.6% above equilibrium. Furthermore, for the assay of Buck, this method of enhancing polarization is particularly suitable as it specifically enhances the NMR signal intensities of the aromatic amino acids that the assay of Buck wishes to analyze [see page 5145 column 2 second paragraph of Buck]. In the present invention, hyperpolarisation may be carried out using a variety of techniques, such as polarisation transfer from a noble gas, "brute force", DNP and the para-hydrogen method. As outlined in detail on page 1 line 31 to page 2 line 29, all of these methods are qualitatively different from CIDNP in that they do not involve contact of the sample with a photoexcited dye. These hyperpolarisation methods are all capable of achieving polarisation levels of at least 0.1% above equilibrium.

Applicant therefore respectfully contends that the polarisation technique presented by Buck is different to those presented in the present invention. In addition, given that the polarisation technique of Buck is particularly suited to the assay described therein, the skilled person would not be motivated to use a different polarisation method. For these reasons, Applicant respectfully submits that claim 1 of the present invention is patentably distinct over Yu in view of Buck and respectfully requests that the rejection should be withdrawn.

All the arguments presented by the examiner in rejection of claims 3-6, 8, 9, 11-15, 20, 27 and 30 are based on the premise that claim 1 is unpatentable over Yu in view of Buck. Applicant respectfully submits that as claim 1 is patentable over Yu in view of Buck for the reasons presented above, each of claims 3-6, 8, 9, 11-15, 20, 27 and 30 are also patentable over the cited prior art. Reconsideration and withdrawal of these rejections are respectfully requested.

In view of the amendments and remarks hereinabove, Applicant respectfully submits that the instant application, including claims 1, 3-6, 8, 9, 11-15, 20, 27, and 30, is allowable over the prior art. Favorable action thereon is respectfully requested.

Any questions with respect to the foregoing may be directed to Applicant's undersigned counsel at the telephone number below.

Respectfully submitted,

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(*Phytolacca americana* of the family Phytolaccaceae, the pokeweed family) with racemose white flowers, dark purple juicy berries, a poisonous root, and young shoots sometimes used as potherbs
po·key \'pō-kē\ *n, pl* **pokeys** [origin unknown] (ca. 1919) *slang* : JAIL
poky *or* **pok·ey** \'pō-kē\ *adj* **pok·i·er; -est** [[2]*poke*] (1844) **1** : small and cramped **2** : SHABBY, DULL **3** : annoyingly slow — **pok·i·ly** \-kə-lē\ *adv* — **pok·i·ness** \-kē-nəs\ *n*
pol \'päl\ *n* (ca. 1942) : POLITICIAN
Po·la·bi·an \pō-'lä-bē-ən, -'lā-\ *n* [*Polab*, ultim. fr. Polabian *po* on + *Lābi*, the Elbe River] (1866) **1** *or* **Po·lab** \pō-'läb\ : a member of a Slavic people formerly dwelling in the basin of the Elbe and on the Baltic coast of Germany **2** : the extinct West Slavic language of the Polabians
Po·lack \'pō-,läk, -,lak\ *n* [Pol *polak*] (1574) **1** *obs* : a native or inhabitant of Poland **2** *usu disparaging* : a person of Polish birth or descent
Po·land Chi·na \'pō-lən(d)-'chī-nə\ *n* [*Poland*, Europe + *China*, Asia] (1879) : any of an American breed of large white-marked black swine
[1]**po·lar** \'pō-lər\ *adj* [NL *polaris*, fr. L *polus* pole] (1551) **1** **a** : of or relating to a geographical pole or the region around it **b** : coming from or having the characteristics of such a region **c** (1) : passing over a celestial body's north and south poles ⟨a satellite in a ~ orbit⟩ (2) : traveling in a polar orbit ⟨a ~ satellite⟩ **2** : of or relating to one or more poles (as of a magnet) **3** : serving as a guide **4** : diametrically opposite **5** : exhibiting polarity, *esp* : having a dipole or characterized by molecules having dipoles ⟨a ~ solvent⟩ **6** : resembling a pole or axis around which all else revolves : PIVOTAL **7** : of, relating to, or expressed in polar coordinates ⟨~ equations⟩; *also* : of or relating to a polar coordinate system
[2]**polar** *n* (1848) : a straight line related to a point; *specif* : the straight line joining the points of contact of the tangents from a point exterior to a conic section
polar bear *n* (1781) : a large creamy-white bear (*Thalarctos maritimus* syn. *Ursus maritimus*) that inhabits arctic regions
polar body *n* (1888) : a cell that separates from an oocyte during meiosis and that contains a nucleus produced in the first or second meiotic division but very little cytoplasm
polar circle *n* (1551) : either of the two parallels of latitude each at a distance from a pole of the earth equal to about 23 degrees 27 minutes
polar coordinate *n* (1816) : either of two numbers that locate a point in a plane by its distance from a fixed point on a line and the angle this line makes with a fixed line
polar front *n* (1920) : the boundary between the cold air of a polar region and the warmer air of lower latitudes
po·lar·im·e·ter \,pō-lə-'ri-mə-tər\ *n* [ISV, fr. *polarization*] (ca. 1859) **1** : an instrument for determining the amount of polarization of light or the proportion of polarized light in a partially polarized ray **2** : a polariscope for measuring the amount of rotation of the plane of polarization esp. by liquids — **po·lar·i·met·ric** \pō-,lar-ə-'me-trik\ *adj* — **po·lar·im·e·try** \,pō-lə-'ri-mə-trē\ *n*
Po·lar·is \pə-'lar-əs, -'lär-\ *n* [NL, fr. *polaris* polar] : NORTH STAR
po·lar·ise *Brit var of* POLARIZE
po·lar·i·scope \pō-'lar-ə-,skōp\ *n* [ISV, fr. *polarization*] (1829) **1** : an instrument for studying the properties of or examining substances in polarized light **2** : POLARIMETER 2 — **po·lar·i·scop·ic** \-,lar-ə-'skä-pik\ *adj*
po·lar·i·ty \pō-'lar-ə-tē, pə-\ *n, pl* **-ties** (1646) **1** : the quality or condition inherent in a body that exhibits opposite properties or powers in opposite parts or directions or that exhibits contrasted properties or powers in contrasted parts or directions : the condition of having poles **2** : attraction toward a particular object or in a specific direction **3** : the particular state either positive or negative with reference to the two poles or to electrification **4** **a** : diametrical opposition **b** : an instance of such opposition
po·lar·i·za·tion \,pō-lə-rə-'zā-shən\ *n* (1812) **1** : the action of polarizing or state of being or becoming polarized: as **a** (1) : the action or process of affecting radiation and esp. light so that the vibrations of the wave assume a definite form (2) : the state of radiation affected by this process **b** : an increase in the resistance of an electrolytic cell often caused by the deposition of gas on one or both electrodes **c** : MAGNETIZATION **2** **a** : division into two opposites **b** : concentration about opposing extremes of groups or interests formerly ranged on a continuum
po·lar·ize \'pō-lə-,rīz\ *vb* **-ized; -iz·ing** [F *polariser*, fr. NL *polaris* polar] *vt* (1811) **1** : to cause (as light waves) to vibrate in a definite pattern **2** : to give physical polarity to **3** : to break up into opposing factions or groupings ⟨a campaign that *polarized* the electorate⟩ **4** : CONCENTRATE 1 ⟨recreate a cohesive rock community by *polarizing* . . . an amorphous, fragmented audience —Ellen Willis⟩ ~ *vi* : to become polarized — **po·lar·iz·abil·i·ty** \,pō-lə-,rī-zə-'bi-lə-tē\ *n* — **po·lar·iz·able** \,pō-lə-'rī-zə-bəl\ *adj*
polar nucleus *n* (1882) : either of the two nuclei of a seed plant embryo sac that are destined to form endosperm
po·lar·og·ra·phy \,pō-lə-'rä-grə-fē\ *n* [ISV, fr. *polarization*] (1936) : a method of qualitative or quantitative analysis based on current-voltage curves obtained during electrolysis of a solution with a steadily increasing electromotive force — **po·lar·o·graph·ic** \pō-,lar-ə-'gra-fik\ *adj* — **po·lar·o·graph·i·cal·ly** \-fi-k(ə-)lē\ *adv*
Po·lar·oid \'pō-lə-,rȯid\ *trademark* — used esp. for a light-polarizing material used esp. in eyeglasses and lamps to prevent glare or for a camera that develops pictures instantly
po·lar·on \'pō-lə-,rän\ *n* [ISV *polar* + [2]*-on*] (1946) : a conducting electron in an ionic crystal together with the induced polarization of the surrounding lattice
pol·der \'pōl-dər\ *n* [D] (1604) : a tract of low land (as in the Netherlands) reclaimed from a body of water (as the sea)

. . . on the starting line for a race
[2]**pole** *vb* **poled; pol·ing** *vt* (1573) **1** : to act upon with a pole . . . impel or push with a pole ~ *vi* **1** : to propel a boat with a . . . : to use ski poles to gain speed
[3]**pole** *n* [ME, fr. L *polus*, fr. Gk *polos* pivot, pole; akin to Gk . . . become, Skt *carati* he moves, wanders — more at WHEEL] . . . : either extremity of an axis of a sphere and esp. of the earth's . . . **a** : either of two related opposites **b** : a point of guidance . . . tion **3** **a** : either of the two terminals of an electric cell, . . . erator, or motor **b** : one of two or more regions in a m . . . at which the magnetic flux density is concentrated **4** : either . . . morphologically or physiologically differentiated areas at . . . ends of an axis in an organism or cell — see BLASTULA ill . . . : the fixed point in a system of polar coordinates that serves . . . origin **b** : the point of origin of two tangents to a conic . . . determine a polar — **poles apart** : as diametrically opposed . . . ble
Pole \'pōl\ *n* [G, of Slavic origin; akin to Pol *polak* Pole] (15 . . . native or inhabitant of Poland **2** : a person of Polish descent
[1]**pole·ax** \'pō-,laks\ *n* [ME *polax*, *pollax*, fr. *pol*, *polle* poll + . . . **1** : a battle-ax with a short handle and often a hook or spike . . . the blade; *also* : one with a long handle used as an ornament . . . **2** : an ax used in slaughtering cattle
[2]**poleax** *vt* (1882) : to attack, strike, or fell with or as if with a . . .
pole bean *n* (ca. 1770) : a cultivated bean that is usu. trained . . . upright on supports
pole·cat \'pōl-,kat\ *n, pl* **polecats** *or* **polecat** [ME *polcat*, prob . . . *poul*, *pol* cock + ME *cat*; prob. fr. its preying on poultry — . . . PULLET] (14c) **1** : any of several carnivorous mammals (as of . . . era *Mustela* or *Vormela*) of the weasel family; *esp* : a brown . . . European mammal (*M. putorius*) from which the domesticated . . . derived **2** : SKUNK
poleis *pl of* POLIS
pole·less \'pōl-ləs\ *adj* (1647) : having no pole
po·lem·ic \pə-'le-mik\ *n* [F *polémique*, fr. MF, fr. *polemique* . . . sial, fr. Gk *polemikos* warlike, hostile, fr. *polemos* war; perh . . . *pelemizein* to shake, OE *calfelo* baleful] (1638) **1** **a** : an . . . attack on or refutation of the opinions or principles of another . . . art or practice of disputation or controversy — usu. used . . . sing. or pl. in constr. **2** : an aggressive controversialist : . . .
po·lem·i·cist \-'le-mə-sist\ *n*
po·lem·i·cal \-mi-kəl\ *also* **po·lem·ic** \-mik\ *adj* (1640) **1** : . . . ing to, or being a polemic : CONTROVERSIAL **2** : engaged in . . . to polemics : DISPUTATIOUS — **po·lem·i·cal·ly** \-mi-k(ə-)lē\ *adv*
po·lem·i·cize \-'le-mə-,sīz\ *vi* **-cized; -ciz·ing** (1950) : to . . . controversy : deliver a polemic
po·le·mist \pə-'le-mist, 'pä-lə-mist\ *n* (1825) : one skilled in . . . polemics
pol·e·mize \'pä-lə-,mīz\ *vi* **-mized; -miz·ing** (1828) : . . .
pol·e·mo·ni·um \,pä-lə-'mō-nē-əm\ *n* [NL, fr. Gk *polemōnion* . . . (1900) : JACOB'S LADDER 1
po·len·ta \pō-'len-tə, pə-, -,tä\ *n* [It, fr. L, crushed and h . . . akin to L *pollen* fine flour] (1764) : mush made of chestnut . . . meal, semolina, or farina
pol·er \'pō-lər\ *n* (1848) : one that poles; *esp* : one that poles a . . .
pole·star \'pōl-,stär\ *n* **1** : NORTH STAR **2** **a** : a directing . . . : GUIDE **b** : a center of attraction
pole vault *n* (ca. 1890) : a vault with the aid of a pole; *specif* . . . event consisting of a vault for height over a crossbar — . . . — **pole–vaulter** *n*
pole·ward \'pōl-wərd\ *adv or adj* (1875) : toward or in the . . . a pole of the earth ⟨as the sun moves ~⟩ ⟨~ variation in . . .⟩
[1]**po·lice** \pə-'lēs\ *vt* **po·liced; po·lic·ing** [in sense 1, fr. MF . . . *police* conduct of public affairs, in other senses, fr. [2]*police*] . . . *archaic* : GOVERN **2** : to control, regulate, or keep in order . . . police **3** : to make clean and put in order **4** **a** : to . . . operation, execution, or administration of to prevent or . . . prosecute violations of rules and regulations **b** : to exercise . . . pervision over the policies and activities of **5** : to perform . . . tions of a police force in or over
[2]**police** *n, pl* **police** *often attrib* [F, fr. LL *politia* government . . . tration, fr. Gk *politeia*, fr. *politēs* citizen, fr. *polis* city, state . . . *pur* rampart, Lith *pilis* castle] (1716) **1** **a** : the internal . . . or regulation of a political unit through exercise of gover . . . ers esp. with respect to general comfort, health, morals, safety, . . . perity **b** : control and regulation of affairs affecting the g . . . and welfare of any unit or area **c** : the system of laws for . . . such control **2** **a** : the department of government concerned . . . ily with maintenance of public order, safety, and health and . . . ment of laws and possessing executive, judicial, and legislative . . . **b** : the department of government charged with prevention . . . and prosecution of public nuisances and crimes **3** **a** : POLICE . . . *pl* : POLICE OFFICERS **4** **a** : a private organization resembling . . . force ⟨campus ~⟩ **b** *pl* : the members of a private police . . . **5** **a** : the action or process of cleaning and putting in order . . . tary personnel detailed to perform this function
police action *n* (1933) : a localized military action un . . . formal declaration of war by regular armed forces against . . . guerrillas or aggressors) held to be violators of internationa . . . order
police court *n* (1823) : a court of record that has juri . . . various minor offenses (as breach of the peace) and the pow . . .

. . . to resemble a policeman . . .
. . . whole wide world —R. B. Long⟩
. . . n (1800) : a member of a police force
. . . *n* (1827) : the inherent power of a government to exercise . . . control over persons and property within its jurisdiction in . . . of the general security, health, safety, morals, and welfare . . . where legally prohibited
. . . **procedural** *n, pl* **police procedurals** (1967) : a mystery story . . . from the point of view of the police investigating the crime
. . . **reporter** *n* (1834) : a reporter regularly assigned to cover police . . . crimes and arrests)
. . . **state** *n* (1865) : a political unit characterized by repressive gov- . . . control of political, economic, and social life usu. by an . . . exercise of power by police and esp. secret police in place of . . . operation of administrative and judicial organs of the govern- . . . ing to publicly known legal procedures
. . . *n* (1846) : the headquarters of the police for a locality
. . . \pə-'lēs-,wu̇-mən\ *n* (1853) : a woman who is a member of a police force
. . . \'pä-lə-sē\ *n, pl* **-cies** *often attrib* [ME *policie* government, . . . MF, government, regulation, fr. LL *politia*] (15c) **1** **a** . . . or wisdom in the management of affairs **b** : management . . . based primarily on material interest **2** **a** : a definite . . . or method of action selected from among alternatives and in . . . given conditions to guide and determine present and future . . . **b** : a high-level overall plan embracing the general goals . . . able procedures esp. of a governmental body
. . . *n, pl* **-cies** [alter. of earlier *police*, fr. MF, certificate, fr. OIt . . . modif. of ML *apodixa* receipt, fr. MGk *apodeixis*, fr. Gk, proof, . . . *apodeiknynai* to demonstrate — more at APODICTIC] (1565) **1** : a . . . whereby a contract of insurance is made **2** **a** : a daily lottery . . . participants bet that certain numbers will be drawn from a . . . **b** : NUMBER 7a
. . . **-er** \'pä-lə-sē-,hōl-dər\ *n* (1851) : the owner of an insur- . . .
. . . **science** *n* (1950) : a social science dealing with the making of . . . policy (as in a government or business)
. . . \-lē-,ō\ *n* (1931) : POLIOMYELITIS
. . . \,pō-lē-(,)ō-,mī-ə-'lī-təs\ *n* [NL, fr. Gk *polios* gray + . . . marrow — more at FALLOW, MYEL-] (1878) : an acute infectious . . . disease characterized by fever, motor paralysis, and atrophy of . . . muscles often with permanent disability and deformity and . . . by inflammation of nerve cells in the anterior gray matter in . . . half of the spinal cord — called also *infantile paralysis*
. . . \'pō-lē-(,)ō-,vī-rəs\ *n* [NL, fr. *poliomyelitis* + *virus*] (1953) . . . virus that occurs in several antigenically distinct forms and . . . tive agent of human poliomyelitis
. . . -ləs\ *n, pl* **po·leis** \'pä-,lās\ [Gk — more at POLICE] (1894) : a . . . city-state; *broadly* : a state or society esp. when characterized by . . . of community
. . . *comb form* [LL, fr. Gk, fr. *polis*] : city ⟨megalo*polis*⟩
. . . \'pä-lish\ *vb* [ME *polisshen*, fr. MF *poliss-*, stem of *polir*, fr. L . . . (14c) **1** : to make smooth and glossy usu. by friction : BUR- . . . : to smooth, soften, or refine in manners or condition **3** : to . . . a highly developed, finished, or refined state : PERFECT ~ *vi* . . . smooth or glossy by or as if by friction — **pol·ish·er** *n*
. . . *n* (1704) **1** **a** : a smooth glossy surface : LUSTER **b** : freedom . . . rudeness or coarseness : CULTURE **c** : a state of high develop- . . . refinement **2** : the action or process of polishing **3** : a prep- . . . that is used to produce a gloss and often a color for the protec- . . . decoration of a surface ⟨furniture ~⟩ ⟨nail ~⟩
. . . \'pō-lish\ *adj* [*Pole*] (1674) : of, relating to, or characteristic of . . . the Poles, or Polish
. . . *n* (1784) : the Slavic language of the Poles
. . . *vt* (1829) : to finish off or dispose of rapidly or completely
. . . \'pä-lət-,byu̇r-(,)ō, 'pō-lət-, pə-'lit-\ *n* [Russ *politbyuro*, fr. . . . *byuro* political bureau] (1925) : the principal policy- . . . and executive committee of a Communist party
. . . \pə-'līt\ *adj* **po·lit·er; -est** [L *politus*, fr. pp. of *polire*] (1501) **1** . . . relating to, or having the characteristics of advanced culture **b** . . . by refined cultural interests and pursuits esp. in arts and . . . **2** **a** : showing or characterized by correct social usage . . . by an appearance of consideration, tact, deference, or cour- . . . **c** : marked by a lack of roughness or crudities ⟨~ literature⟩ . . . CIVIL — **po·lite·ly** *adv* — **po·lite·ness** *n*
. . . \,pä-li-'tes, ,pō-\ *n* [F, fr. MF, cleanness, fr. OIt *pulitezza*, fr. . . . of *pulire* to polish, clean, fr. L *polire*] (1717) : formal polite- . . . DECOROUSNESS
. . . \'pä-lə-,tik\ *adj* [ME *politik*, fr. MF *politique*, fr. L *politicus*, fr . . . fr. *politēs* citizen — more at POLICE] (15c) **1** : POLITICAL . . . characterized by shrewdness in managing, contriving, or dealing **3** . . . in promoting a policy **4** : shrewdly tactful *syn* see EXPE- . . .
. . . SLAVE
. . . \pə-'li-ti-kəl\ *adj* [L *politicus*] (1551) **1** **a** : of or relating . . . government, a government, or the conduct of government **b** : of, . . . to, or concerned with the making as distinguished from the . . . tion of governmental policy **2** : of, relating to, involving, . . . in politics and esp. party politics **3** : organized in govern- . . . terms ⟨~ units⟩ **4** : involving or charged or concerned with . . . a government or a political system ⟨~ prisoners⟩ — **po·lit-** . . . \-k(ə-)lē\ *adv*
. . . **action committee** *n* (1944) : a group formed (as by an in- . . . or an issue-oriented organization) to raise and contribute money . . . campaigns of candidates likely to advance the group's interests

and practices which could . . . sex or race) should be elimi . . .
political science *n* (1779) : . . . description and analysis of . . . and processes — **political** . . .
pol·i·ti·cian \,pä-lə-'ti-shən . . . art or science of governmen . . . the business of a governmen . . . as a profession **b** : a perso . . . selfish or other narrow usu. . . .
po·lit·i·cise *Brit var of* POLIT . . .
po·lit·i·cize \pə-'li-tə-,sīz\ . . . cal tone or character to ⟨ar . . . **ci·za·tion** \-,li-tə-sə-'zā-sh . . .
pol·i·tick \'pä-lə-,tik\ *vi* [ba . . . [3]*-ing*] (ca. 1934) : to enga . . . activity — **pol·i·tick·er** *n*
po·lit·i·co \pə-'li-ti-,kō\ *n*, . . . ultim. fr. L *politicus* politica . . .
pol·i·tics \'pä-lə-,tiks\ *n pl* . . . pl. of *politikos* political] (ca . . . ment **b** : the art or scie . . . governmental policy **c** : . . . and holding control over a . . . or policies **3** **a** : politic . . . tween competing interest . . . ship (as in a government) . . . or profession **c** : politica . . . dishonest practices **4** : t . . . son **5** **a** : the total cor . . . society **b** : relations or co . . . as seen or dealt with from . . .
pol·i·ty \'pä-lə-tē\ *n, pl* **-ti** . . . : political organization **2** . . . : a politically organized u . . . litically organized unit **b** . . . nomination
pol·ka \'pōl-kə, 'pō-kə\ *n* [. . . Pole] (1844) **1** : a vivacio . . . time with a basic pattern . . . dance tune in [2]/[4] time — **p** . . .
pol·ka dot \'pō-kə-,dät\ *n* . . . tributed dots in textile de . . . təd\ *adj*
[1]**poll** \'pōl\ *n* [ME *pol*, *pol* . . . or back of the head **b** : . . . tool (as a hammer) **4** **a** . . . a body of persons (2) : . . . votes are cast or recorded . . . riod of time during whic . . . total number of votes rec . . . canvassing of persons sel . . . mation or opinions to be . . . obtained
[2]**poll** *vt* (14c) **1** **a** : to cu . . . SHEAR **b** : to cut off or c . . . the top of (as a tree); *spe* . . . horns of (cattle) **3** **a** : . . . quest each member of to . . . **4** : to receive (as votes) i . . . poll **6** : to test (as sever . . . sequence for messages to . . . poll — **poll·ee** \pō-'lē\ *n*
pol·lack *or* **pol·lock** \'pä . . . perh. fr. ScotGael *pollag* . . . tant north Atlantic food . . . bling the cods but dark . . . Pacific food fish (*Thera* . . . closely resembles the poll . . .
[1]**pol·lard** \'pä-lərd\ *n* [[2]*p* . . . promote the growth of a . . .
[2]**pollard** *vt* (1670) : to ma . . .
polled \'pōld\ *adj* (1584) . . .
pol·len \'pä-lən\ *n* [NL . . . mass of microspores in a . . . dusty bloom on the body . . .
pollen basket *n* (1860) : . . . is edged by a fringe of . . . pollen — called also *corb* . . .
pollen grain *n* (1835) : . . . pollen and give rise to th . . .
pol·len·iz·er *also* **pol·lin** . . . (1897) **1** : a plant that . . .
pollen mother cell *n* (1 . . . mis of the pollen sac and . . . which develops into a po . . .
pollen sac *n* (1875) : on . . . pollen is formed

\ə\ abut \ᵊ\ kitten, F tal . . . \au̇\ out \ch\ chin \e\ . . . \ŋ\ sing \ō\ go \ȯ\ law . . . \y\ yet \zh\ vision \ä, k . . .

one of the four basal ganglia in each of the limbic system and consists of an latter in the anterior extremity of the *ydoloid nucleus*

dia] (1651): a white crystalline cyanoound esp. in the seeds of the apricot.

mygdaloïdés, fr. amygdale] (1836) **1** g to, or affecting an amygdala
d*l, ad*) (1813): of, being, or containc that are filled with deposits of differcalcite) — **amyg-da-loid** \a-'mig-da-

-yl] (1850): a univalent hydrocarbon various isomeric forms and is derived

amylum, fr. Gk *amylon*, fr. neut. of *o-* + *mylē* mill — more at MEAL

\NA-OH, eight isomeric alcohols $C_5H_{12}O$ used sters, also: a commercially produced as a solvent

893): any of a group of enzymes (as ts of starch and glycogen or then

ale yellow pungent flammable liquid myl alcohol and nitrous acid — com-

IXY transluscent substance consisting of yssaccharides that is deposited in some abnormal conditions (as Alzheimer's

\ n [NL] (ca. 1900): a disorder char- ylosis in bodily organs and tissues. *id* [NL *amyloïdus*, fr. *amyl-* + *-yloïd*] stable of the enzymatic splitting of mzymes) — activity)

sis (1905): a component of starch and branched structure and does not

n (1886): a colorless plastic that

[*amyl-* + *-pan* (as in *propan*)] (ca atic juice

8/77): a component of starch characuose units

[NL] (ca. 1919): deficiency of mus-

ils \ˌa-mə-ˈnō-sə-ˌlāz, -ˈtrā-\ *n* [ˌa- + ase progressive degenerative fatal dis- beginning in middle age, and char- randing muscular weakness — called

— used for amobarbital

ME, fr. OE *in one* — more at ONE]

usage see ONE

: AND **2** \ˈan(d) *archaic*: if

n & -*an* fr. ME, *an-*, *in-*, fr. OF & L. ana, fr. -*anus* adj. suffix + *-ia* -nə\ *n* [NL] **1**: one that is of or relating to : skilled in or specializing in \phonet-

1 : of or belonging to \Americans\ resembling the characteristics of -one, *-ine*, & *-ane*] **1**: unsaturated ydride of a carbohydrate (*anan\ GK. at the rate of. lit., up] (14c) : at prescriptions

nas [-ənz] (ca 1751) **1**: a collection rson **2**: a collection of anecdotes or rson or a place

back, again, fr. *ana* up — more at on] back ; backward (anaptyxis).

1: of or -*anus* -an & -*ianus* -ən\ sp. anecdotal or bibliographical con-

\ n [NL *anabaptismus*, fr. LGk *ana* ism to rebaptize, fr. Gk *ana-* again + *p* a : the doctrine or practices of *the* t movement **2** : the baptism of one

1 : a Protestant sectarian of a radical ory and advocating the baptism ad- lievers only, nonresistance, and the **Anabaptist** *also* **an-a-bap-**

ases \ˌa-nə-ˈbā-ˌsās, ˌan-ə-\ *n* [NL, ana- + *-bainein* to go — more at ascending impulse : ADVANCE *esp* : a pul- of Greek mercenaries in Asia Minor xenophon] **2** : a difficult and dangerous

Gk *anabatos*, verbal of *anabainein* \an ~ wind\

a group of two synthetic hormones olism and are sometimes abused by sparingly the size of their muscles.

\ˌa-nə-ˈnā-ˌsās, -ˈnā-\ *n* [NL] : the concerned esp. with macromolecules

an-ba-ho-ic \ˌa-nə-bə-ˈhō-ik\ *adj*

\ *n* [prob. fr. MGk *anachronismos*, fr. onism. fr. Gk *anachronizein* to be late, fr. Gk *ana-* + *chronos* time] (ca. 1646) **1** : an error in chronology esp : a chronological misplacing of persons, events, objects, or customs in regard to each other **2** : a person or a thing that is chronologically out of place, esp : one from a former age that is incongruous in the present — **anach-ro-nis-tic** \ə-ˌna-krə-ˈnis-tik\ *also* **anach-ron-ic** \ə-ˌna-ˈkrä-nik\ *adj* — **anach-ro-nis-ti-cal-ly** \ə-ˌna-krə-ˈnis-ti-k(ə-)lē\ *adv* — **anach-ro-nous** \ə-ˈna-krə-nəs\ *adj* — **anach-ro-nous-ly** *adv*

an-a-clit-ic \ˌa-nə-ˈkli-tik\ *adj* [Gk *anaklitos*, verbal of *anaklinein* to lean upon, fr. *ana-* + *klinein* to lean — more at LEAN] (1922) : of, relating to, or characterized by the direction of love toward an object (as the mother) that satisfies (as hunger)

an-e-co-la-thon \ˌa-nə-kə-ˈlā-thän\ *n, pl* **-tha** \-thə\ *also* **-thons** [LL, fr. Gk *anakolouthon* inconsistency in logic, fr. Gk, neut. of *anakolouthos* inconsistent, fr. *an-* + *akolouthos* following — more at ACOLYTE] : syntactical inconsistency or incoherence within a sentence; *esp* : a shift in an unfinished sentence from one syntactic construction to another (as in "you really ought—well, do it your own way")

an-a-co-lu-thic \-thik\ *adj* — **an-a-co-lu-thi-cal-ly** \-thi-k(ə-)lē\ *adv*

an-a-cre-on-tic \ə-ˌna-krē-ˈän-tik\ *n* [prob. modif. of Anglolatine *heneticus* (*Anacreon* + *-eticus* -ETIC) (1766)] : a large semiaquatic constricting snake (*Eunectes murinus*) of the tropical parts of South America that may reach a length of 30 feet (9.1 meters); *broadly* : any of the large constricting snakes

anacrotic limb

an-a-cre-on-tic \ˌa-nə-krē-ˈän-tik\ *n* (1656) : a poem in the manner of Anacreon, *esp* : a drinking song or light lyric

Anacreontic *adj* [L *anacreonticus*, fr. *Anacreon*, *Anacreont* Anacreon, fr. Gk *Anakreont-*, *Anakreōn*] (1611) **1** : of, relating to, or resembling the poetry of Anacreon **2** *often not capitalized* : convivial or amatory

an-a-crot-ic \ˌa-nə-ˈkrä-tik\ *adj* [Gk *anakrotos* rising, fr. *anakrouein* to strike, beat, skim to land (*ana-* + *krouein* to strike)] (1830) : of or relating to the ascending limb of the wave of arterial pulse that are reproduced as preliminary to

an-a-cru-sis \ˌa-nə-ˈkrü-səs\ *n, pl* **-cru-ses** \-ˌsēz\ [NL, fr. Gk *anakrousis* beginning of a song, fr. *anakrouein* to begin a song, fr. *ana-* + *krouein* to strike, beat, akin to Lith *kraušyti* to strike] (1830) : one or more syllables at the beginning of a line of poetry that are not a part of the metrical pattern **2** : UPBEAT, *specif* : one or more notes or tones preceding the first downbeat in a musical phrase

an-a-dama bread \ˌa-nə-ˈda-mə-\ *n* [origin unknown] (1954) : a heavy sweet bread made from flour, cornmeal, and molasses

an-a-dem \ˈa-nə-ˌdem\ *n* [L *anadema*, fr. Gk *anadēma*, fr. *anadein* to wreathe, fr. *ana-* + *dein* to bind — more at DIADEM] (1604) *archaic* : a wreath for the head or brow

an-a-di-plo-sis \ˌa-nə-də-ˈplō-səs, ˌa-nə-ˌdī-ˈplō-\ *n, pl* **-plo-ses** \-ˌsēz\ [LL, fr. Gk *anadiplōsis*, fr. *anadiplousthai* to double, fr. *ana-* + *diploun* to double — more at DIPLOMA] (ca. 1550) : repetition of a word at the end and the last word in one phrase or clause at the beginning of the next (as in "Truly the sun has risen, the sun has risen")

an-a-dro-mous \ə-ˈna-drə-məs\ *adj* [Gk *anadromos* running upward, fr. *anadramein* to run upward, fr. *ana-* + *dramein* to run — more at DROMEDARY] (ca. 1753) : ascending rivers from the sea for breeding — compare CATADROMOUS

an-a-ema, anae-mic, anaemia *chiefly Brit var of* ANEMIA, ANEMIC

an-a-erobe \ˈa-nə-ˌrōb, (ˌ)an-ˈa-ə(ə)r-ˌōb, -ˈe(ə)r-\ *n* [ISV] (1884) : an anaerobic organism

an-a-erobic \ˌa-nə-ˈrō-bik, ˌan-ə(ə)r-, -ˌe(ə)r-\ *adj* (ca. 1881) **1** : living, active, or occurring in the absence of free oxygen (*anaerobic* respiration) **2** : of, relating to, or being activity in which the body incurs an oxygen debt (*anaerobic* exercise) **2**: relating to or induced by anaerobes (*anaerobic* infection) — **an-a-ero-bi-cal-ly** *adv*

an-a-ero-bi-o-sis \ˌa-nə-rō-ˌbī-ˈō-səs, -ˌrō-, ˌan-ə(ə)r-, ˌe(ə)r-\ *n, pl* **-o-ses** \-ˌsēz\ [NL] (ca. 1889) : life in the absence of or free oxygen

an-a-es-the-sia, an-aes-thet-ic *chiefly Brit var of* ANESTHESIA, ANESTHETIC

an-a-gen-e-sis \ˌa-nə-ˈje-nə-səs\ *n* [NL] (1889) : evolutionary change involving a single lineage in which one taxon replaces another without appearance of a branch

an-a-glyph \ˈa-nə-ˌglif\ *n* [LL *anaglyphus* embossed, fr. Gk *anaglyphos*, fr. *anaglyphein* to emboss, fr. *ana-* + *glyphein* to carve — more at CLEAVE] (1651) **1** : a sculptured, chased, or embossed ornament **2** : a picture printed for a stereoscopic motion or still picture in which each component picture is printed in opposite pairs of color to be superimposed on the left component in a contrasting color to produce a three-dimensional effect when viewed through correspondingly colored filters in the form of spectacles — **an-a-glyph-ic** \ˌa-nə-ˈglif-ik\ *adj*

an-a-gno-ris \ˌa-nəg-ˈnō-səs\ *n, pl* **-ri-ses** \-ˌsēz\ [Gk *anagnōrisis*, fr. *anagnōrizein* to recognize, fr. *ana-* + *gnōrizein* to make known, fr. *gnōros* well-known, *gignōskein* to come to know — more at KNOW] (ca. 1900) : the point in the play of a tragedy at which the protagonist recognizes his or her or some other character's true identity and discovers the consequences of previous actions

an-a-go-gy \ˈa-nə-ˌgō-jē\ *n, pl* **-gies** *or* **-gies** [LL *anagogia*, fr. Gk *anagōgē*, fr. Gk, reference, fr. *anagein* to refer, fr. *ana-* + *agein* to lead — more at AGENT] (15c) : mystical interpretation of words (as of Scripture or poetry) that finds beyond the literal, historical, and allegorical sense a fourth and ultimate spiritual or mystical sense — **an-a-gog-ic** \ˌa-nə-ˈgä-jik\ *or* **an-a-gog-i-cal** \-ji-kəl\ *adj* — **an-a-gog-i-cal-ly** \-ji-k(ə-)lē\ *adv*

an-a-gram \ˈa-nə-ˌgram\ *n* [prob. fr. MF *anagramme*, fr. NL *anagramma*, modif. of Gk *anagrammatismos*, fr. *anagrammatizein* to transpose letters, fr. *ana-* + *grammat-*, *gramma* letter — more at GRAMMAR] (1589) **1** : a word or phrase made by transposing the letters of another word or phrase (*esp* : a name in which the letters are formed by rearranging the letters of other words or by letters taken from a stock of cards or blocks at random) **2** : a game in which anagrams are formed — **an-a-gram-mat-i-cal** \ˌa-nə-grə-ˈma-ti-kəl\ *also* **an-a-gram-mat-ic** \-ˈma-tik\ *adj* — **an-a-gram-mat-i-cal-ly** \-ti-k(ə-)lē\ *adv*

1anagram *vt* **-grammed**; **-gram-ming** (1630) **1** : ANAGRAMMATIZE **2** : to rearrange (the letters of a text) in order to discover a hidden message

an-a-gram-ma-tize \ˌa-nə-ˈgra-mə-ˌtīz\ *vt* **-tized**; **-tiz-ing** (1588) : to transpose (as letters in a word) so as to form an anagram — **an-a-gram-ma-ti-za-tion** \-ˌgra-mə-tə-ˈzā-shən\ *n*

anal \ˈā-nᵊl\ *adj* (1769) **1** : of, relating to, or situated near the anus (~ fin) **2** a : of, relating to, characterized by, or being the stage of psychosexual development in psychoanalytic theory during which the child is concerned esp. with its feces **b** : of, relating to, characterized by, or being personality traits (as parsimony, meticulousness, and ill humor) considered typical of fixation at the anal stage of development (~ disposition) (~ neatness) — **anal-ly** \-nᵊl-ē\ *adv*

anal-cime \ˈa-nal-ˌsēm\ *n* [fr. Gk *analkimos* weak, fr. *an-* + *alkimos* strong, fr. *alkē* strength] (1803) : a white or slightly colored mineral that consists of hydrated silicate of sodium and aluminum and occurs in various igneous rocks in massive form or in crystals

anal-cite \ˈa-nal-ˌsīt\ *n* (1868) : ANALCIME

anal-ects \ˈa-nᵊl-ˌekt(s)\ *also* **an-a-lec-ta** \ˌa-nᵊl-ˈek-tə\ *n pl* [NL *analecta*, fr. Gk *analekta*, neut. pl. of *analektos*, verbal of *analegein* to collect, fr. *ana-* + *legein* to gather — more at LEGEND] (1652) : selected miscellaneous written passages

an-a-lem-ma \ˌa-nə-ˈle-mə\ *n* [L, sundial on a pedestal, fr. Gk *analēmma*, lofty structure, sundial, fr. *analambanein* to take up, restore, fr. *ana-* + *lambanein* to take — more at LATCH] (1832) : a plot or graph of the position of the sun in the sky at a certain time of day (as noon) at one locale measured at regular intervals throughout the year that has the shape of a figure 8; *also* : a scale (as on a globe or sundial) based on such a plot that indicates for the sun's position for each day of the year or that allows local mean time to be determined — **an-a-lem-mat-ic** \ˌa-nə-lə-ˈma-tik\ *adj*

an-a-lep-tic \ˌa-nə-ˈlep-tik\ *n* [Gk *analēptikos*, fr. *analambanein*] (1671) : a drug that stimulates the central nervous system — **analeptic** *adj*

an-al-ge-sia \ˌa-nᵊl-ˈjē-zhə, -zē-ə\ *n* [NL, fr. Gk *analgēsia*, fr. *an-* + *algēsia* sense of pain, fr. *algein* to suffer pain, fr. *algos* pain] (ca. 1706) : insensibility to pain without loss of consciousness — **an-al-ge-sic** \-ˈjē-zik, -sik\ *adj or n* — **an-al-get-ic** \-ˈje-tik\ *adj or n*

anal-ity \ˌa-ˈna-lə-tē\ *n, pl* **-ties** [1] : the psychological state or quality of being anal

an-a-log \ˈa-nᵊl-ˌȯg, -ˌäg\ *adj* (1948) **1** : of, relating to, or being an analogue **2** a : of, relating to, or being a mechanism in which data is represented by continuously variable physical quantities **b** : of or relating to an analog computer **3** : being or displaying a watch without minute hands

analog computer *n* (1948) : a computer that operates with numbers represented by directly measurable quantities (as voltages or rotations)

— compare DIGITAL COMPUTER, HYBRID COMPUTER

an-a-log-ical \ˌa-nᵊl-ˈä-ji-kəl\ *also* **an-a-log-ic** \-ik\ *adj* (1609) **1** : of, relating to, or based on analogy **2** : expressing or implying analogy — **an-a-log-i-cal-ly** \-k(ə-)lē\ *adv*

anal-o-gist \ə-ˈna-lə-jist\ *n* (ca. 1828) : one who searches for or reasons from analogies

anal-o-gize \-ˌjīz\ *vb* **-gized**; **-giz-ing** *vi* (1655) : to use or exhibit analogy ~ *vt* : to compare by analogy

anal-o-gous \ə-ˈna-lə-gəs\ *adj* [L *analogus*, fr. Gk *analogos*, fr. *analogia*, *analogy*] (1599) : having a likeness in some respects

an-a-logue *or* **an-a-log** \ˈa-nᵊl-ˌȯg, -ˌäg\ *n* [F *analogue*, fr. *analogue* analogous, fr. Gk *analogos*] (1826) **1** : something that is analogous or similar to something else **2** : an organ similar in function to that of an organ of another animal or plant but different in structure and origin **3** *usu analog* : a chemical compound that is structurally similar to another but differs slightly in composition (as in the replacement of one atom by an atom of a different element in one of two analogous compounds of a particular functional group) **4** : a food product made by combining a less expensive food (as soybeans or whitefish) with additives to give the appearance and taste of a more expensive food (as beef or crab)

an-a-logue *chiefly Brit var of* ANALOG

anal-o-gy \ə-ˈna-lə-jē\ *n, pl* **-gies** (15c) **1** : inference that if two or more things agree with one another in some respects they will probably agree in others **2** a : resemblance in some particulars between things otherwise unlike : SIMILARITY **b** : comparison based on such resemblance **3** : correspondence between the members of pairs or sets of linguistic forms that serves as a basis for the creation of another form **4** : correspondence in function between anatomical parts of different structure and origin — compare HOMOLOGY — *syn* see LIKENESS

an-al-pha-bet \ˌa-nal-ˈfa-ˌbet, -bət\ *n* [Gk *analphabētos* not knowing the alphabet, fr. *an-* + *alphabētos* alphabet] (ca. 1889) : one who cannot read ; ILLITERATE — **an-al-pha-bet-ic** \ˌan-al-fə-ˈbe-tik\ *adj or n* — **an-al-pha-bet-ism** \ˌan-ˈal-fə-bə-ˌti-zəm\ *n*

anal-y-sand \ə-ˈna-lə-ˌsand\ [*analyse* + *-and* (as in *multiplicand*)] (1917) : one who is undergoing psychoanalysis

ana-lyse *chiefly Brit var of* ANALYZE

anal-y-sis \ə-ˈna-lə-səs\ *n, pl* **-y-ses** \-ˌsēz\ [NL, fr. Gk, fr. *analyein* to break up, fr. *ana-* + *lyein* to loosen — more at LOSE] (1581) **1** a : separation of a whole into its component parts **2** a : the identification or separation of ingredients of a substance **b** : a statement of the constituents of a mixture **3** : proof of a mathematical proposition by assuming the result and deducing a valid statement by a series of reversible steps **b** : a branch of mathematics concerned variously with functions and limits (2) : CALCULUS **1b 4** a : an examination of a complex, its elements, and their relations **b** : a statement of such an analysis **5** a : a method in philosophy of resolving complex expressions into simpler or more basic ones **b** : clarification of an expression by an elucidation of its use in discourse **6** : the use of function words

US007107169B2

(12) **United States Patent**
Vary

(10) **Patent No.: US 7,107,169 B2**
(45) **Date of Patent: Sep. 12, 2006**

(54) **DEVICE FOR ESTIMATING THE MASS FLOW OF FUEL**

(75) Inventor: **Florian Vary**, Melun (FR)

(73) Assignee: **Snecma Moteurs**, Paris (FR)

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G01F 1/12 (2006.01)
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(52) **U.S. Cl.** **702/100**; 702/45; 73/1.16; 73/1.34; 700/282

(58) **Field of Classification Search** 702/98, 702/100, 13, 8; 73/1.16, 1.19, 1.21, 1.23, 73/1.34, 1.35, 1.57, 1.59, 861, 861.01, 861.42; 700/282–285
See application file for complete search history.

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(57) **ABSTRACT**

The invention relates to a device for determining a measurement of mass flow of fluid for a combustion chamber comprising a fluid metering device and a means of measuring the position of the metering device being measured. This device comprises:

a mass flow meter,

a hybridisation device for determining an actual mass flow of fluid comprising:

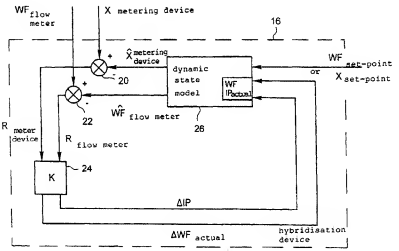
a first input comprising a set-point value (WF set-point, Xset-point),

a prediction unit (**26**) capable of determining, from the first input and variables of state comprising the actual mass flow (WF actual) and parametric unknowns (IP), estimated values (˜WF flow meter, ˜Xmetering device), a second input comprising the measured position of the metering device (Xmetering device) and the measured mass flow of fluid (WF flow meter),

a calculator of residues (**30**, **22**, **20**) for determining a first residue (Rmetering device) between the measured position of the metering device and the estimated position of the metering device and a second residue (Rflow meter) between the measured mass flow of fluid and the estimated mass flow of fluid,

a correction unit (**24**) for determining, from the first and second residues corrections capable of being applied to variables of state (WF actual, IP).

18 Claims, 4 Drawing Sheets



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A8- $Z = \left[\frac{WF_{actuel}}{IP}\right]$

A9- $Y = \left[\frac{\hat{W}F_{flow\_meter}}{\hat{X}_{metering\_device}}\right]$

A10- $U = [WF \text{ set-point or } X \text{ set-point}]$

A11- $Z_{n+1} = F \cdot Z_n + U_n$

$Y_{n+1} = H \cdot Z_n$

A12 NOTATIONS

Xconsigne: metering device position sought
WFconsigne: mass fuel flow sought
WFreel: mass flow actually delivered by the metering system
WFdebitmetre mass flow measured by the flow meter
ˆWFdebitmetre estimated mass flow
ΔWFreel correction of actual mass flow
Xdoseur measured position of the metering device slide valve
ˆXdoseur estimated position of the metering device slide valve
Rdebitmetre residue of mass flow
Rdoseur residue of the position of the metering device slide valve
IP vector of parametric unknowns
ΔIP correction vector of vector of parametric unknowns
K correction gain matrix
z vector of state of filter
Y vector of estimated outputs
U vector of set-point inputs
H output matrix
F state matrix
Q matrix of covariance of the state interference
v state interference
R matrix of covariance of measurement interference
w measurement interference

What is claimed is:

1. A device for determining a measurement of mass fluid flow for a combustion chamber comprising a fluid metering device and a means of measuring the position of metering device known as the measured position, said device comprising:

a mass flow meter for measuring a mass flow of fluid known as the measured flow,

a hybridisation device suitable for determining an actual mass flow of fluid comprising:

a first input comprising a set-point value (WFset-point) of the mass flow sought or a set-point value (Xset-point) of the position of the metering device sought,

a prediction unit capable of determining, from the first input and variables of state comprising the actual mass flow (WFactual) and parametric unknowns (IP), estimated values comprising the estimated position of the metering device (ˆXmetering device) and the estimated mass flow (AWF flow meter),

a second input comprising the measured position of the metering device (Xmetering device) and the measured fluid mass flow (WFflow meter),

a calculator of residues capable of determining a first residue (Rmetering device) between the measured position of the metering device and the estimated position of the metering device and a second residue (Rflow meter) between the measured fluid mass flow and the estimated fluid mass flow,

a correction unit capable of determining from the first and second residues corrections capable of being applied by the prediction unit to the variables of state (Wfactual, IP).

2. A device according to claim **1**, wherein the prediction unit comprises a dynamic model at the state linking the first input to the variables of state and estimated values.

3. A device according to claim **1**, wherein the correction unit comprises a correction gain matrix whose coefficients are fixed.

4. A devicc according to claim **1**, wherein the correction unit comprises a correction gain matrix whose coefficients are variable.

5. A device according to claim **1**, wherein the correction unit comprises a correction gain matrix whose coefficients are variable and the coefficients are determined by a mathematical law dependent on the mass flow of fluid or on the position of the metering device.

6. A device according to claim **1**, wherein the correction unit comprises a correction gain matrix whose coefficients are variable and the correction gain matrix is a gain matrix of the Kalman filter (K), determined dynamically.

7. A device according to claim **1**, wherein the correction unit comprises a correction gain matrix whose coefficients are variable the correction gain matrix is a gain matrix of the Kalman filter (K), determined dynamically by the use of matrices relating to the interference, submitted to continuous adaptation of their coefficients.

8. A device according to claim **1**, wherein the first input further comprises a measured value of the temperature of the fluid (Tfuel).

9. A device according to claim **1**, wherein the second input comprises a measured value of a pressure differential through the fluid metering device (ˆδPmeasurement), the estimated values comprise an estimated value of this pressure differential (ˆδPmeasurement), the residue calculator is capable of determining a third residue ($R_{\delta P}$), between the measured value and the estimated value of the pressure differential, and the correction unit is capable of determining, from the first. second and third residues, corrections suitable for application by the prediction unit to the variables of state.

10. A process of determining a measurement of mass flow of a fluid for a combustion chamber, said process comprising the steps of:

a- entering a set-point value (WFset-point) of the mass flow sought or a set-point value (X set-point) of the position of the metering device sought, and variables of state comprising the actual mass flow (WF actual) and parametric unknowns (IP),

b- determining from step a- estimated values comprising the estimated position of the fluid metering device (ˆX metering device) and the estimated mass flow (ˆWF-flow meter),

c- measuring the mass flow of fluid (WFflow meter) from a mass flow meter and the position of the fluid metering device (Xflow meter),

d- calculating a first residue (Rmetering device) between the measured position of the metering device and the estimated position of the metering device and a second residue (Rflow meter) between the measured mass flow of fluid and the estimated mass flow of fluid,

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(12) **United States Patent**
Choo et al.

(10) **Patent No.: US 7,186,550 B2**
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(54) **NUCLEIC ACID MOLECULE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 296 days.

This patent is subject to a terminal disclaimer.

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(58) **Field of Classification Search** 435/320.1; 536/23.1, 24.1; 514/44

See application file for complete search history.

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(57) **ABSTRACT**

The present invention is directed generally to an isolated nucleic acid molecule encompassing a neocentromere or a functional derivative thereof or a latent, synthetic or hybrid form thereof and its use inter alia in developing a range of eukaryotic artificial chromosomes including mammalian (e.g. human) and non-mammalian an artificial chromosomes. Such artificial chromosomes are useful in a range of genetic therapies.

20 Claims, 223 Drawing Sheets

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taaaaaagtt gacgtgtaaa atccatgtaa aaaagttggc agaagagaca aactggtaaa    300

gcagcogttc ttcattttctc atttcattca acaagcatta ttaacagcct agcaagaaca    360

cagtatccag gaaaaatcaa agattatcaa gctcatgttc tataatcaag caatttatea    420

actagcagaa gaacaagaca gatgaataag aacttgggta tatttaaatg ctaagaagtt    480

caattcaaat aaatgtcc                                                  498
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The invention claimed is:

1. An isolated nucleic acid molecule comprising a neocentromere, wherein said neocentromere comprises a region of an eukaryotic chromosome and does not have any detectable alpha satellite DNA as determined by fluorescent in situ hybridisation (FISH), wherein said nucleic acid molecule comprises SEQ ID NO: 3, and wherein said nucleic acid molecule, when introduced into a cell, is capable of replicating, acting as an extra-chromosomal element and segregating with cell division.

2. The isolated nucleic acid molecule according to claim **1** wherein the eukaryotic chromosome is a mammalian chromosome.

3. The isolated nucleic acid molecule according to claim **2** wherein the chromosome is a human chromosome.

4. The isolated nucleic acid molecule according to claim **2** wherein the nucleic acid molecule binds to centromeric binding proteins (CENP)-A and -C or antibodies thereto.

5. The isolated nucleic acid molecule according to claim **3** wherein the chromosome is human chromosome 10.

6. The isolated nucleic acid molecule according to claim **5** wherein said neocentromere comprises a region mapping between q24 and q26 on said human chromosome 10.

7. The isolated nucleic acid molecule according to claim **3** wherein said human chromosome is a mardel (10) chromosome.

8. The isolated nucleic acid molecule of claim **1** wherein said nucleic acid molecule is in linear form and co-introduced into a cell together with a telomeric sequence.

9. The isolated nucleic acid molecule according to claim **8** wherein the eukaryotic chromosome is a mammalian chromosome.

10. The isolated nucleic acid molecule according to claim **9** wherein said nucleic acid molecule binds to CENP-A and CENP-C antibodies.

11. The isolated nucleic acid molecule according to claim **9** wherein the mammalian chromosome is human chromosome 10.

12. The isolated nucleic acid molecule according to claim **11** wherein the neocentromere comprises a region mapping between q24 and q26 on said human chromosome 10.

13. The isolated nucleic acid molecule according to claim **8** wherein said chromosome is a human mardel (10) chromosome.

14. A genetic construct comprising an origin of replication for a eukaryotic cell and the nucleic acid molecule of claim **1**, operably linked to telomeric nucleotide sequences functional in the cell in which the genetic construct is to replicate and wherein said genetic constructs when introduced into a cell, is a replicating, extra-chromosomal element which segregates with cell division.

15. The genetic construct according to claim **14** wherein the eukaryotic chromosome is a mammalian chromosome.

16. The genetic construct according to claim **15** wherein the eukaryotic chromosome is a human chromosome.

17. The genetic construct according to claim **16** wherein the nucleic acid molecule binds to CENP-A and -C or antibodies thereto.

18. The genetic construct according to claim **17** wherein the neocentromere is from human chromosome 10.

19. The genetic construct according to claim **18** wherein the neocentromere comprises a region between q24 and q26 on said human chromosome 10.

20. The genetic construct according to claim **18** wherein said chromosome is a human mardel (10) chromosome.

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